Endoscopic Removal of the Antral Portion of Antrochoanal Polyp by Powered Instrumentation

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Objectives: To introduce a new surgical technique for endoscopic removal of the antral portion of antrochoanal polyp (ACP) by powered instrumentation and to determine its efficacy by measures of relevant patient outcome. Study Design: Prospective study in 28 patients undergoing endoscopic sinus surgery for ACP by our surgical technique. Methods: Improvements of clinical symptoms and endoscopic and computed tomographic findings were evaluated postoperatively with a follow-up period ranging from 12 to 52 months. All symptom scores on a 100-mm visual analogue scale before operation were compared with those at the last visit after operation. Postoperative endoscopic and computed tomographic findings were graded using a three-point scale ranging from 0 to 2. In surgical technique, the antral portion of ACP was identified through the enlarged ostium under intranasal endoscopy and removed by a blade of powered instrumentation that was inserted through the canine fossa. Results: Symptom scores were all significantly reduced postoperatively. All but one patient showed improvement in clinical symptoms and endoscopic and computed tomographic findings during the follow-up period. There were no major complications specific to this technique. Conclusion: Our technique provides an attractive alternative to other methods for removing the antral portion of ACP and is associated with excellent outcomes and minimal morbidities. Key Words: Endoscopic removal, antrochoanal polyp, powered instrumentation.

INTRODUCTION

Antrochoanal polyp (ACP) is a maxillary sinus polyp that originates in the maxillary sinus, passes through a sinus ostium, and extends into the choana.¹ To minimize postsurgical recurrence, it is essential to completely remove the antral portion of ACP, together with the base of its origin. Because endoscopic sinus surgery (ESS) has been reported to be useful in the surgery of ACP,²,³ radical surgery of the maxillary sinus for ACP has recently been replaced by ESS. In the current techniques for endoscopic removal of the antral portion of ACP, instrumentation by forceps and visualization with endoscopes are usually performed through the enlarged sinus ostium. This procedure can be effective only when the origin of ACP is localized, but it is time-consuming when its origin is broadly based. Furthermore, stripping of vital intact membranes around the origin is often unavoidable with current instrumentation because even tiny pediatric forceps are grabbing tools.

Powered instrumentation, a recently developed device for sinus surgery, provides a good surgical field by shaving and removing the soft tissue along with fluid and allows the intact mucosa to be spared during dissection.⁴ The aims of the current study are to introduce a new surgical technique for endoscopic removal of the antral portion of ACP by powered instrumentation and to determine its efficacy by measures of relevant patient outcome.

MATERIALS AND METHODS

Twenty-eight patients with ACP (18 male and 10 female patients; age range, 6–50 years; mean age, 14.8 years) who were diagnosed on the basis of history, physical examination, endoscopic and computed tomographic findings were included in this study. They had no medical history of allergic rhinitis, asthma, or aspirin hypersensitivity. All patients had unilateral ACP and underwent ESS by our new surgical technique using powered instrumentation (Hummer, Stryker Instruments, Kalamazoo, MI) at the Department of Otolaryngology, Ewha Womans University Mokdong Hospital (Seoul, Korea) from June 1, 1996, to December 31, 1998, with a follow-up period ranging from 12 to 52 months (mean follow-up, 24.5 mo). Improvements of clinical symptoms and endoscopic and CT findings were evaluated postoperatively. All patients were required to assess their own sensation of overall nasal difficulty on a 100-mm visual analogue scale. The scale was designed with one extreme symptom score being “my nose is completely free” (0 mm,
no symptoms) and the other being “my nose is extremely ill” (100 mm, worst possible symptoms). All patients with nasal obstruction or nasal discharge (rhinorrhea or postnasal drip) were also required to assess the symptom on a 100-mm visual analogue scale. All symptom scores before operation were compared with those at the last visit after operation. Statistical analysis was performed using the paired \( t \) test with a significance level of \( P = .05 \). In addition, the number of patients with improvement of each symptom (overall nasal difficulty, nasal obstruction, or nasal discharge) was also counted after the patients had rated degree of each symptomatic improvement as improved or not at the end of follow-up.

The improvement in endoscopic findings of the 28 maxillary sinuses was evaluated postoperatively at the last visit. The sinus mucosa was observed through the enlarged natural ostium, using a 4-mm, 70° or 120° endoscope. Endoscopic findings were graded using a three-point scale ranging from 0 to 2 (0, normal; 1, partially edematous; 2, recurrence of ACP).

Because one of the 28 patients refused a postoperative CT examination, we evaluated the improvement in CT findings of the 27 maxillary sinuses of the remaining patients. The postoperative CT scans were obtained at least 1 year after operation. Computed tomographic findings were graded using a three-point scale ranging from 0 to 2 (0, no or little opacity within the maxillary sinus; 1, partial opacity; suggesting mild mucoperiosteal thickening but no recurrence; 2, round opacity suggesting recurrence or near-total opacity or both)).

**Surgical Technique**

After administration of local or general anesthesia, patients are placed in supine position with the head slightly elevated. The usual technique of ESS\(^5\) is performed. When the ethmoid sinuses are intact, only infundibulotomy without complete ethmoidectomy is sufficient to progress to the following steps. The intranasal portion of ACP is removed and the natural ostium of the maxillary sinus is enlarged, to obtain a good surgical view of the sinus. If the polyp has emerged from the maxillary sinus through the accessory ostium, both ostia are connected to each other. The natural or accessory ostium is often found to be already enlarged by the disease process. A trocar consisting of a cannula and a sheath is inserted sublabially into the maxillary sinus through the canine fossa, and the cannula is removed, leaving the sheath in the canine fossa. A 4-mm, 30° endoscope is inserted into the maxillary sinus through the sheath to examine the interior of the sinus.

After careful observation of the maxillary sinus, the endoscope and the sheath are removed, and a cutter blade (Jaguar Cutter, Stryker Instruments, Kalamazoo, MI) of powered instrumentation is inserted into the sinus through the hole created by the above-mentioned procedures (Figs. 1 and 2). The blade tip is identified through the enlarged ostium under intranasal endoscopy using a 70° endoscope. A 90° or 120° endoscope is sometimes used when the maxillary sinus is not well visualized with a 70° endoscope. Then the antral portion of the ACP is resected by powered instrumentation. It is set to a speed of 1600 rpm in oscillating mode, and suction power is set at 180 mm Hg.

The maxillary sinus mucosa is irrigated with physiological saline on a weekly basis. Oral antibiotic (5 to 8 mg/kg roxithromycin per day) is administered for 2 to 3 weeks.

**RESULTS**

**Symptomatic Improvement**

Preoperative symptom scores of overall nasal difficulty (67.9 ± 11.5), nasal obstruction (72.1 ± 12.2), and nasal discharge (54.8 ± 21.3) improved to 19.0 ± 9.0, 13.1 ± 11.1, and 18.3 ± 9.2, respectively, after surgery (Table I). These improvements were all statistically significant (\( P < .05 \), paired \( t \) test). Before surgery, all 28 patients complained of nasal obstruction and 19 of the 28 patients reported nasal discharge as a complaint. Twenty-seven (96.4%) of the 28 patients with nasal obstruction and 18 (94.7%) of the 19 patients with nasal discharge had symptomatic improvement postoperatively. Overall nasal difficulty improved in 27 (96.4%) of the 28 patients.

**Endoscopic and Radiographic Improvement**

Sixteen (57.1%) of the 28 maxillary sinuses showed endoscopic improvement of grade 0, and 11 (39.3%) im-
proved to grade 1 (Table II). ACP recurred in one patient. The improvement rate was 96.4% (27 of 28 sinuses) when grades 0 and 1 were defined as endoscopically improved. Seventeen (63.0%) of the 27 maxillary sinuses improved to grade 0 and 9 (33.3%) improved to grade 1 on postoperative CT scans (Table II). In the one patient in whom ACP recurred, the maxillary sinus showed a CT finding of grade 2. The improvement rate was 96.3% (26 of 27 sinuses) when grades 0 and 1 were defined as radiographically improved. Figure 3 shows a preoperative coronal CT scan of a patient having ACP in the left-side maxillary sinus and a postoperative one demonstrating grade 0 improvement.

Postoperative Complications

Although the cheek area was compressed by applying a sponge ball at the end of the operation, mild cheek swelling with pain occurred in two patients. The swelling was considered to be the result of minimal bleeding or edema of the sublabial area where the trocar had been inserted. However, it subsided spontaneously in a few days. No patients had infraorbital hypesthesia after surgery. There were no major complications specific to this technique. No effect on sinus or facial growth was observed in all patients younger than 15 years of age during our follow-up period (12 to 52 mo).

DISCUSSION

It is generally recommended that the antral portion of ACP should be removed, together with the base of its origin, to minimize postsurgical recurrence. A Caldwell-Luc approach offers a good exposure and ensures complete removal of the polyp and the associated antral mucosa. However, ACP occurs most commonly in children and young adults, and the Caldwell-Luc procedure carries significant risks to the developing teeth and the bone growth centers of the maxilla in children. Although modified procedures such as osteoplastic surgery have been developed to minimize these risks, they still have other possible side effects including cheek swelling, cheek anesthesia, and longer recovery time. Because ESS has been reported to be useful in the surgery of ACP, radical surgery of the maxillary sinus has recently been replaced by ESS.

Successful outcomes have been reported using endoscopic surgery of ACP with no cases of recurrence. In the current techniques, instrumentation by forceps and visualization with endoscopes are usually performed through the enlarged sinus ostium. However, endoscopic removal of ACP still has a few limitations when the antral portion of the polyp is removed only through the middle meatal antrostomy. This procedure can be effective only when the origin of ACP is localized, and it is time-consuming when its origin is broadly based. Furthermore, surgeons may sometimes encounter difficulty in accessing the antral portion with the manual instruments only through the enlarged ostium when the base is located at unfavorable portions such as the anterior or inferior portions of the maxillary sinus. Another limitation is that stripping of vital membranes around the origin is often unavoidable with manual instrumentation. Apart from the origin of ACP, the remainder of the maxillary sinus membrane is usually normal and should be preserved to promote healing.

We think that our technique can overcome most of the limitations in endoscopic removal of ACP by using powered instrumentation and combining a transcaneous approach with the middle meatal approach. Our technique is more efficient than a middle meatal approach alone, requiring 15 minutes or less to resect the antral portion of the ACP, even when its origin was broadly based. One of

<table>
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<th>Symptom</th>
<th>Preoperative</th>
<th>Postoperative</th>
<th>Improvement No. (%)</th>
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<tbody>
<tr>
<td>Overall nasal difficulty</td>
<td>67.9 ± 11.5</td>
<td>19.0 ± 9.0*</td>
<td>27 (96.4)</td>
</tr>
<tr>
<td>Nasal obstruction</td>
<td>72.1 ± 12.2</td>
<td>13.1 ± 11.1*</td>
<td>27 (96.4)</td>
</tr>
<tr>
<td>Nasal discharge</td>
<td>54.8 ± 21.3</td>
<td>18.3 ± 9.2*</td>
<td>18 (94.7)</td>
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*Statistically different from preoperative symptom scores (P < .05, paired t-test).
the other benefits is that it allows surgeons to have access to most parts of the maxillary sinus walls except for far peripheral portions anteriorly. The ACP usually originates from the posterior, inferior, lateral, and medial walls, rarely being found anteriorly.\(^1\) Therefore, our technique can be useful for removing almost all types of ACP. Some authors\(^{10,11}\) have advocated removal of the antral portion through an inferior meatal antral window. However, the approach does not always allow sufficient exposure of the antral walls even after resection of the anterior portion of the inferior turbinate.\(^{12}\) Furthermore, troublesome bleeding from the resected margin of the inferior turbinate may occur. Our technique provides superior visualization and is less invasive than the inferior meatal approach. The route of instrumentation for removing the antral portion of ACP is different from that of visualization of the polyp, and the powered instrumentation allows the operator to resect and remove diseased tissue and fluid simultaneously. Only transcanine puncture is added to a middle meatal approach. Although El-Guindy and Mansour\(^{12}\) introduced the transcanine approach combined with a middle meatal approach, there remains the possibility of avulsion of the healthy membrane around the origin because of a grabbing technique using forceps. Our technique allows the intact membrane around the ACP origin to be spared, whereas the base of the ACP is completely shaved off the sinus wall. In our experience, powered instrumentation, characterized by its precise cutting action, permits sharp excision of polyps without stripping the adjacent intact membrane and complete removal of the base of the ACP by adjusting suction power.

In our series, symptom scores of overall nasal difficulty, nasal obstruction, and nasal discharge were all significantly reduced postoperatively. All but one patient showed improvement in clinical symptoms and endoscopic and CT findings during the follow-up period. An overall improvement rate of 96.4% (27 of 28 patients) was observed. Antrochoanal polyp recurred in one patient. Technical inexperience at the early stage of our study is a possible cause of the recurrence in this patient.

In the current study, mild cheek swelling with pain was noted in two patients, subsiding in a few days without specific treatments. However, our series revealed no significant complications associated with transcanine puncture, such as infraorbital hypesthesia and abnormal facial growth during the follow-up period. In our hands, this technique is less invasive than osteoplastic surgery\(^8\) or a “mini” Caldwell-Luc procedure.\(^{13}\) When ACP originates from far peripheral portions of the anterior wall, the tip of a straight powered-instrumentation blade may fail to reach the origin. In this situation, a curved blade (RAD 40 or RAD 60 X-Treme, Xomed, Jacksonville, FL) by the XPS 2000 model (Xomed) may be useful for removal of the origin.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Endoscopic Findings* (n = 28) no. (%)</th>
<th>CT Findings† (n = 27) no. (%)</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>16 (57.1)</td>
<td>17 (63.0)</td>
</tr>
<tr>
<td>1</td>
<td>11 (39.3)</td>
<td>9 (33.3)</td>
</tr>
<tr>
<td>2</td>
<td><strong>1</strong> (3.6)</td>
<td><strong>1</strong> (3.7)</td>
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*Grades of endoscopic findings; 0 = normal, 1 = partially edematous, 2 = recurrence of antrochoanal polyp.
†Grades of CT findings; 0 = no or little opacity within the maxillary sinus; 1 = partial opacity, suggesting mild mucoperiosteal thickening but no recurrence; 2 = round opacity suggesting recurrence, and/or near total opacity.‡This indicates the same maxillary sinus of one patient in whom antrochoanal polyp recurred.

Fig. 3. Preoperative (A) and postoperative (B) coronal computed tomography scans of a 14-year-old patient with antrochoanal polyp in the left-side maxillary sinus. Total opacity on preoperative computed tomography scan improved on postoperative scan. The radiographic improvement was assessed as grade 0.
The results of the current study suggest that our technique provides an attractive alternative to other methods for removing the antral portion of an ACP and is associated with excellent outcomes and minimal morbidities.

BIBLIOGRAPHY